

## SEQUENCE LISTING

<110> USUDA, Yoshihiro  
KURAHASHI, Osamu

<120> Method for Producing L-Methionine by Fermentation

<130> OP914

<140>

<141> 1999-11-

<150> JP 10-326717

<151> 1998-11-17

<160> 29

<170> PatentIn Ver. 2.0

<210> 1

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 1

gggaattctg gcaggagaa ctggcgca

28

<210> 2

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 2

gggtcgacgc tcatattggc actggaag 28  
<210> 3  
<211> 28  
<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence:primer  
  
<400> 3  
gggtcgacat cagtaaaatc tattcatt 28  
  
<210> 4  
<211> 28  
<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence:primer  
  
<400> 4  
ggaagcttgc ccgaggaaa gatctgta 28  
  
<210> 5  
<211> 28  
<212> DNA  
<213> Artificial Sequence  
  
<220>  
<223> Description of Artificial Sequence:primer  
  
<400> 5  
gggcatgcc agggaaacttc atcacatg 28  
  
<210> 6  
<211> 28  
<212> DNA  
<213> Artificial Sequence  
  
<220>

<223> Description of Artificial Sequence:primer

<400> 6

g g g a a t t c t c a t g g t t g c g g c g t g a g a g

28

<210> 7

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 7

g g a a g c t t g c g t g a g a t g g g g a t t a a c c

28

<210> 8

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 8

g g g a a t t c t a c t g c t a g c t g c

28

<210> 9

<211> 75

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 9

g g a a g c t t a a a t t t t a t t g a c t t a g g t c a c t a a a t a c t t a t a c c a a t a t a g g c a t a g c g 60  
c a c a g a c g c a t g c c c

75

<210> 10

<211> 75

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 10

ggccatgcgt ctgtgcgcta tgcctataatt ggttaaagta tttagtgacc taagtcaata 60  
aaattttaag cttcc 75

<210> 11

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 11

caacagttt agctaacc

18

<210> 12

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 12

gcggtttt tgccggatgc

20

<210> 13

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 13

tcggctacgc aactaatg 18  
<210> 14  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer

<400> 14  
gagaatgcac cgccaccg 18  
<210> 15  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer

<400> 15  
tggcgcgtca cggtggcg 18  
<210> 16  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer

<400> 16  
gcacgtcggt ttcattag 18  
<210> 17  
<211> 1155  
<212> DNA  
<213> Escherichia coli

<220>

&lt;221&gt; CDS

&lt;222&gt; (1)..(1152)

&lt;400&gt; 17

atg gca aaa cac ctt ttt acg tcc gag tcc gtc tct gaa ggg cat cct	48
Met Ala Lys His Leu Phe Thr Ser Glu Ser Val Ser Glu Gly His Pro	
1 5 10 15	
gac aaa att gct gac caa att tct gat gcc gtt tta gac gcg atc ctc	96
Asp Lys Ile Ala Asp Gln Ile Ser Asp Ala Val Leu Asp Ala Ile Leu	
20 25 30	
gaa cag gat ccg aaa gca cgc gtt gct tgc gaa acc tac gta aaa acc	144
Glu Gln Asp Pro Lys Ala Arg Val Ala Cys Glu Thr Tyr Val Lys Thr	
35 40 45	
ggc atg gtt tta gtt ggc ggc gaa atc acc acc agc gcc tgg gta gac	192
Gly Met Val Leu Val Gly Glu Ile Thr Thr Ser Ala Trp Val Asp	
50 55 60	
atc gaa gag atc acc cgt aac acc gtt cgc gaa att ggc tat gtg cat	240
Ile Glu Glu Ile Thr Arg Asn Thr Val Arg Glu Ile Gly Tyr Val His	
65 70 75 80	
tcc gac atg ggc ttt gac gct aac tcc tgt gcg gtt ctg agc gct atc	288
Ser Asp Met Gly Phe Asp Ala Asn Ser Cys Ala Val Leu Ser Ala Ile	
85 90 95	
ggc aaa cag tct cct gac atc aac cag ggc gtt gac cgt gcc gat ccg	336
Gly Lys Gln Ser Pro Asp Ile Asn Gln Gly Val Asp Arg Ala Asp Pro	
100 105 110	
ctg gaa cag ggc gcg ggt gac cag ggt ctg atg ttt ggc tac gca act	384
Leu Glu Gln Gly Ala Gly Asp Gln Gly Leu Met Phe Gly Tyr Ala Thr	
115 120 125	
aat gaa acc gac gtg ctg atg cca gca cct atc acc tat gca cac cgt	432
Asn Glu Thr Asp Val Leu Met Pro Ala Pro Ile Thr Tyr Ala His Arg	
130 135 140	
ctg gta cag cgt cag gct gaa gtg cgt aaa aac ggc act ctg ccg tgg	480
Leu Val Gln Arg Gln Ala Glu Val Arg Lys Asn Gly Thr Leu Pro Trp	
145 150 155 160	
ctg cgc ccg gac gcg aaa agc cag gtg act ttt cag tat gac gac ggc	528
Leu Arg Pro Asp Ala Lys Ser Gln Val Thr Phe Gln Tyr Asp Asp Gly	
165 170 175	
aaa atc gtt ggt atc gat gct gtc gtg ctt tcc act cag cac tct gaa	576
Lys Ile Val Gly Ile Asp Ala Val Val Leu Ser Thr Gln His Ser Glu	
180 185 190	
gag atc gac cag aaa tcg ctg caa gaa ggc gta atg gaa gag atc atc	624

Glu Ile Asp Gln Lys Ser Leu Gln Glu Ala Val Met Glu Glu Ile Ile			
195	200	205	
aag cca att ctg ccc gct gaa tgg ctg act tct gcc acc aaa ttc ttc			672
Lys Pro Ile Leu Pro Ala Glu Trp Leu Thr Ser Ala Thr Lys Phe Phe			
210	215	220	
atc aac ccg acc ggt cgt ttc gtt atc ggt ggc cca atg ggt gac tgc			720
Ile Asn Pro Thr Gly Arg Phe Val Ile Gly Gly Pro Met Gly Asp Cys			
225	230	235	240
ggt ctg act ggt cgt aaa att atc gtt gat acc tac ggc ggc atg gcg			768
Gly Leu Thr Gly Arg Lys Ile Ile Val Asp Thr Tyr Gly Gly Met Ala			
245	250	255	
cgt cac ggt ggc ggt gca ttc tct ggt aaa gat cca tca aaa gtg gac			816
Arg His Gly Gly Ala Phe Ser Gly Lys Asp Pro Ser Lys Val Asp			
260	265	270	
cgt tcc gca gcc tac gca gca cgt tat gtc gcg aaa aac atc gtt gct			864
Arg Ser Ala Ala Tyr Ala Ala Arg Tyr Val Ala Lys Asn Ile Val Ala			
275	280	285	
gct ggc ctg gcc gat cgt tgt gaa att cag gtt tcc tac gca atc ggc			912
Ala Gly Leu Ala Asp Arg Cys Gln Ile Gln Val Ser Tyr Ala Ile Gly			
290	295	300	
gtg gct gaa ccg acc tcc atc atg gta gaa act ttc ggt act gag aaa			960
Val Ala Glu Pro Thr Ser Ile Met Val Glu Thr Phe Gly Thr Glu Lys			
305	310	315	320
gtg cct tct gaa caa ctg acc ctg ctg gta cgt gag ttc ttc gac ctg			1008
Val Pro Ser Glu Gln Leu Thr Leu Leu Val Arg Glu Phe Phe Asp Leu			
325	330	335	
cgc cca tac ggt ctg att cag atg ctg gat ctg ctg cac ccg atc tac			1056
Arg Pro Tyr Gly Leu Ile Gln Met Leu Asp Leu Leu His Pro Ile Tyr			
340	345	350	
aaa gaa acc gca gca tac ggt cac ttt ggt cgt gaa cat ttc ccg tgg			1104
Lys Glu Thr Ala Ala Tyr Gly His Phe Gly Arg Glu His Phe Pro Trp			
355	360	365	
gaa aaa acc gac aaa gcg cag ctg ctg cgc gat gct gcc ggt ctg aag			1152
Glu Lys Thr Asp Lys Ala Gln Leu Leu Arg Asp Ala Ala Gly Leu Lys			
370	375	380	
taa			1155

&lt;210&gt; 18

&lt;211&gt; 384

&lt;212&gt; PRT

&lt;213&gt; Escherichia coli

&lt;400&gt; 18

Met Ala Lys His Leu Phe Thr Ser Glu Ser Val Ser Glu Gly His Pro  
 1 5 10 15  
 Asp Lys Ile Ala Asp Gln Ile Ser Asp Ala Val Leu Asp Ala Ile Leu  
 20 25 30  
 Glu Gln Asp Pro Lys Ala Arg Val Ala Cys Glu Thr Tyr Val Lys Thr  
 35 40 45  
 Gly Met Val Leu Val Gly Gly Glu Ile Thr Thr Ser Ala Trp Val Asp  
 50 55 60  
 Ile Glu Glu Ile Thr Arg Asn Thr Val Arg Glu Ile Gly Tyr Val His  
 65 70 75 80  
 Ser Asp Met Gly Phe Asp Ala Asn Ser Cys Ala Val Leu Ser Ala Ile  
 85 90 95  
 Gly Lys Gln Ser Pro Asp Ile Asn Gln Gly Val Asp Arg Ala Asp Pro  
 100 105 110  
 Leu Glu Gln Gly Ala Gly Asp Gln Gly Leu Met Phe Gly Tyr Ala Thr  
 115 120 125  
 Asn Glu Thr Asp Val Leu Met Pro Ala Pro Ile Thr Tyr Ala His Arg  
 130 135 140  
 Leu Val Gln Arg Gln Ala Glu Val Arg Lys Asn Gly Thr Leu Pro Trp  
 145 150 155 160  
 Leu Arg Pro Asp Ala Lys Ser Gln Val Thr Phe Gln Tyr Asp Asp Gly  
 165 170 175  
 Lys Ile Val Gly Ile Asp Ala Val Val Leu Ser Thr Gln His Ser Glu  
 180 185 190  
 Glu Ile Asp Gln Lys Ser Leu Gln Glu Ala Val Met Glu Glu Ile Ile  
 195 200 205  
 Lys Pro Ile Leu Pro Ala Glu Trp Leu Thr Ser Ala Thr Lys Phe Phe  
 210 215 220  
 Ile Asn Pro Thr Gly Arg Phe Val Ile Gly Gly Pro Met Gly Asp Cys  
 225 230 235 240  
 Gly Leu Thr Gly Arg Lys Ile Ile Val Asp Thr Tyr Gly Gly Met Ala  
 245 250 255  
 Arg His Gly Gly Ala Phe Ser Gly Lys Asp Pro Ser Lys Val Asp  
 260 265 270  
 Arg Ser Ala Ala Tyr Ala Ala Arg Tyr Val Ala Lys Asn Ile Val Ala  
 275 280 285  
 Ala Gly Leu Ala Asp Arg Cys Glu Ile Gln Val Ser Tyr Ala Ile Gly  
 290 295 300  
 Val Ala Glu Pro Thr Ser Ile Met Val Glu Thr Phe Gly Thr Glu Lys

305                    310                    315                    320  
Val Pro Ser Glu Gln Leu Thr Leu Leu Val Arg Glu Phe Phe Asp Leu  
325                    330                    335  
Arg Pro Tyr Gly Leu Ile Gln Met Leu Asp Leu Leu His Pro Ile Tyr  
340                    345                    350  
Lys Glu Thr Ala Ala Tyr Gly His Phe Gly Arg Glu His Phe Pro Trp  
355                    360                    365  
Glu Lys Thr Asp Lys Ala Gln Leu Leu Arg Asp Ala Ala Gly Leu Lys  
370                    375                    380

<210> 19

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 19

ggaagcttaa gcagagatgc agagtgcg

28

<210> 20

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 20

ggaagcttgg tgcgtataa gaggccac

28

<210> 21

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 21

gggcatgctg tagtgaggta atcaggtt 28  
<210> 22  
<211> 28  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer

<400> 22  
gggtcgactt aatccagcgt tggattca 28  
<210> 23  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer

<400> 23  
tgtctgctgg gcggtaca 18  
<210> 24  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer

<400> 24  
agagagtttt tcggtgcg 18  
<210> 25  
<211> 930  
<212> DNA  
<213> Escherichia coli

<220>

&lt;221&gt; QDS

&lt;222&gt; (1)..(927)

&lt;400&gt; 25

atg	ccg	att	cgt	gtg	ccg	gac	gag	cta	ccc	gcc	gtc	aat	ttc	ttg	cgt	48
Met	Pro	Ile	Arg	Val	Pro	Asp	Glu	Leu	Pro	Ala	Val	Asn	Phe	Leu	Arg	
1		5							10			15				
gaa	gaa	aac	gtc	ttt	gtg	atg	aca	act	tct	cgt	gct	tct	ggt	cag	gaa	96
Glu	Glu	Asn	Val	Phe	Val	Met	Thr	Thr	Ser	Arg	Ala	Ser	Gly	Gln	Glu	
				20				25				30				
att	cgt	cca	ctt	aag	gtt	ctg	atc	ctt	aac	ctg	atg	ccg	aag	aag	att	144
Ile	Arg	Pro	Leu	Lys	Val	Leu	Ile	Leu	Asn	Leu	Met	Pro	Lys	Lys	Ile	
				35				40			45					
gaa	act	gaa	aat	cag	ttt	ctg	cgc	ctg	ctt	tca	aac	tca	cct	ttg	cag	192
Glu	Thr	Glu	Asn	Gln	Phe	Leu	Arg	Leu	Leu	Ser	Asn	Ser	Pro	Leu	Gln	
				50			55			60						
gtc	gat	att	cag	ctg	ttg	<del>gtc</del>	atc	gat	tcc	cgt	gaa	tcg	cgc	aac	acg	240
Val	Asp	Ile	Gln	Leu	Leu	Arg	Ile	Asp	Ser	Arg	Glu	Ser	Arg	Asn	Thr	
				65			70			75			80			
ccc	gca	gag	cat	ctg	aac	aac	ttc	tac	tgt	aac	ttt	gaa	gat	att	cag	288
Pro	Ala	Glu	His	Leu	Asn	Asn	Phe	Tyr	Cys	Asn	Phe	Glu	Asp	Ile	Gln	
				85				90			95					
gat	cag	aac	ttt	gac	ggt	ttg	att	gtc	act	ggt	gct	ccg	ctg	ggc	ctg	336
Asp	Gln	Asn	Phe	Asp	Gly	Leu	Ile	Val	Thr	Gly	Ala	Pro	Leu	Gly	Leu	
				100				105			110					
gtg	gag	ttt	aat	gat	gtc	gct	tac	tgg	<del>ccg</del>	cag	atc	aaa	cag	gtg	ctg	384
Val	Glu	Phe	Asn	Asp	Val	Ala	Tyr	Trp	Pro	Gln	Ile	Lys	Gln	Val	Leu	
				115				120			125					
gag	tgg	tcg	aaa	gat	cac	gtc	acc	tcg	acg	ctg	ttt	gtc	tgc	tgg	gct	432
Glu	Trp	Ser	Lys	Asp	His	Val	Thr	Ser	Thr	Leu	Phe	Val	Cys	Trp	Ala	
				130			135			140						
gta	cag	gcc	gct	ctc	aat	atc	ctc	tac	ggc	att	cct	aag	caa	act	cgc	480
Val	Gln	Ala	Ala	Leu	Asn	Ile	Leu	Tyr	Gly	Ile	Pro	Lys	Gln	Thr	Arg	
				145			150			155			160			
acc	gaa	aaa	ctc	tct	ggc	gtt	tac	gag	cat	cat	att	ctc	cat	cct	cat	528
Thr	Glu	Lys	Leu	Ser	Gly	Val	Tyr	Glu	His	His	Ile	Leu	His	Pro	His	
				165				170			175					
gct	ttt	ctg	acg	cgt	ggc	ttt	gat	gat	tca	ttc	ctg	gca	ccg	cat	tcg	576
Ala	Leu	Leu	Thr	Arg	Gly	Phe	Asp	Asp	Ser	Phe	Leu	Ala	Pro	His	Ser	
				180			185			190						
cgc	tat	gct	gac	ttt	ccg	gca	gct	ttg	att	cgt	gat	tac	acc	gat	ctg	624

Arg Tyr Ala Asp Phe Pro Ala Ala Leu Ile Arg Asp Tyr Thr Asp Leu  
 -- 195 200 205  
 gaa att ctg gca gag acg gaa gaa ggg gat gca tat ctg ttt gcc agt 672  
 Glu Ile Leu Ala Glu Thr Glu Glu Gly Asp Ala Tyr Leu Phe Ala Ser  
 210 215 220  
 aaa gat aag cgc att gcc ttt gtg acg ggc cat ccc gaa tat gat gcg 720  
 Lys Asp Lys Arg Ile Ala Phe Val Thr Gly His Pro Glu Tyr Asp Ala  
 225 230 235 240  
 caa acg ctg gcg cag gaa ttt ttc cgc gat gtg gaa gcc gga cta gac 768  
 Gln Thr Leu Ala Gln Glu Phe Phe Arg Asp Val Glu Ala Gly Leu Asp  
 245 250 255  
 ccg gat gta ccg tat aac tat ttc ccg cac aat gat ccg caa aat aca 816  
 Pro Asp Val Pro Tyr Asn Tyr Phe Pro His Asn Asp Pro Gln Asn Thr  
 260 265 270  
 ccg cga gcg agc tgg cgt agt cac ggt aat tta ctg ttt acc aac tgg 864  
 Pro Arg Ala Ser Trp Arg Ser His Gly Asn Leu Leu Phe Thr Asn Trp  
 275 280 285  
 ctc aac tat tac gtc tac cag atc acg cca tac gat cta cgg cac atg 912  
 Leu Asn Tyr Tyr Val Tyr Gln Ile Thr Pro Tyr Asp Leu Arg His Met  
 290 295 300  
 aat cca acg ctg gat taa 930  
 Asn Pro Thr Leu Asp  
 305

<210> 26  
 <211> 309  
 <212> PRT  
 <213> Escherichia coli

<400> 26

Met	Pro	Ile	Arg	Val	Pro	Asp	Glu	Leu	Pro	Ala	Val	Asn	Phe	Leu	Arg
1														15	
Glu	Glu	Asn	Val	Phe	Val	Met	Thr	Thr	Ser	Arg	Ala	Ser	Gly	Gln	Glu
20														30	
Ile	Arg	Pro	Leu	Lys	Val	Leu	Ile	Leu	Asn	Leu	Met	Pro	Lys	Lys	Ile
35													45		
Glu	Thr	Glu	Asn	Gln	Phe	Leu	Arg	Leu	Leu	Ser	Asn	Ser	Pro	Leu	Gln
50													60		
Val	Asp	Ile	Gln	Leu	Leu	Arg	Ile	Asp	Ser	Arg	Glu	Ser	Arg	Asn	Thr
65													75		80
Pro	Ala	Glu	His	Leu	Asn	Asn	Phe	Tyr	Cys	Asn	Phe	Glu	Asp	Ile	Gln

85	90	95	
Asp Gln Asn Phe Asp Gly Leu Ile Val Thr Gly Ala Pro Leu Gly Leu			
100	105	110	
Val Glu Phe Asn Asp Val Ala Tyr Trp Pro Gln Ile Lys Gln Val Leu			
115	120	125	
Glu Trp Ser Lys Asp His Val Thr Ser Thr Leu Phe Val Cys Trp Ala			
130	135	140	
Val Gln Ala Ala Leu Asn Ile Leu Tyr Gly Ile Pro Lys Gln Thr Arg			
145	150	155	160
Thr Glu Lys Leu Ser Gly Val Tyr Glu His His Ile Leu His Pro His			
165	170	175	
Ala Leu Leu Thr Arg Gly Phe Asp Asp Ser Phe Leu Ala Pro His Ser			
180	185	190	
Arg Tyr Ala Asp Phe Pro Ala Ala Leu Ile Arg Asp Tyr Thr Asp Leu			
195	200	205	
Glu Ile Leu Ala Glu Thr Gln Glu Gly Asp Ala Tyr Leu Phe Ala Ser			
210	215	220	
Lys Asp Lys Arg Ile Ala Phe Val Thr Gly His Pro Glu Tyr Asp Ala			
225	230	235	240
Gln Thr Leu Ala Gln Glu Phe Phe Arg Asp Val Glu Ala Gly Leu Asp			
245	250	255	
Pro Asp Val Pro Tyr Asn Tyr Phe Pro His Asn Asp Pro Gln Asn Thr			
260	265	270	
Pro Arg Ala Ser Trp Arg Ser His Gly Asn Leu Leu Phe Thr Asn Trp			
275	280	285	
Leu Asn Tyr Tyr Val Tyr Gln Ile Thr Pro Tyr Asp Leu Arg His Met			
290	295	300	
Asn Pro Thr Leu Asp			
305			

<210> 27

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:primer

<400> 27

ccagacgcac aagaagttgt c

<210> 28  
<211> 27  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:primer  
<400> 28  
tagatcgtat agcgtagtct ggttagac

27

<210> 29  
<211> 309  
<212> PRT  
<213> Escherichia coli

<400> 29  
Ala Met Leu Pro Val

5